CLAIMS

1. A variable valve operating device for mechanically changing the operating characteristic of a valve in relation to the rotation of a camshaft, the variable valve operating device comprising:

a drive cam that is installed over the camshaft;

a control shaft that is positioned in parallel with the camshaft and capable of changing the rotation position continuously or stepwise;

a swing member that is installed over the control shaft and allowed to swing around the control shaft;

a swing cam surface that is formed on the swing member, comes into contact with a valve support member, which supports the valve, and presses the valve in a lifting direction;

a slide surface that is formed on the swing member so as to face the drive cam;

an intermediate member that is positioned between the drive cam and the swing member and comes into contact with both the slide surface and a cam surface of the drive cam;

a control member that is installed over the camshaft and allowed to rotate;

a support member that is mounted on the control

member to support the intermediate member so that the intermediate member can be moved along a predetermined path in relation to the control member; and

a rotation interlock mechanism for interlocking the rotation of the control member around the camshaft with the rotation of the control shaft.

2. The variable valve operating device according to claim 1, wherein the support member is formed as a guide that is integral with the control member.

3. The variable valve operating device according to claim 2, wherein the guide is formed outward from the center of the camshaft.

4. The variable valve operating device according to claim 1, wherein the support member is configured as a link member for linking the control member to the intermediate member, mounted on the control member, and allowed to swing around a position away from the center of the camshaft.

5. The variable valve operating device according to any one of claims 1 to 4, wherein the rotation interlock mechanism comprises a first gear, which is installed over the control shaft to rotate together

with the control shaft, and a second gear, which is installed over the control member to mesh with the first gear.

6. The variable valve operating device according to any one of claims 1 to 5, wherein the rotation interlock mechanism is a speed reducing mechanism for decelerating the rotation of the control shaft with gears and transmitting the decelerated rotation to the control member.

7. The variable valve operating device according to any one of claims 1 to 6, wherein the swing cam surface includes a nonoperating surface, which is formed at a fixed distance from the swing center of the swing member, and an operating surface, which is contiguous with the nonoperating surface and whose distance to the swing center gradually increases with an increase in the distance to the nonoperating surface; and wherein the valve is lifted when the swing member swings so that the contact position at which the swing cam surface contacts the valve support member moves from the nonoperating surface to the operating surface.

8. The variable valve operating device according to any one of claims 1 to 7, wherein the intermediate member includes a first roller, which comes into contact with the cam surface of the drive cam; a second roller, which is concentric with the first roller and comes into contact with the slide surface; and a connecting shaft, which connects the first roller to the second roller so as to permit the first and second rollers to rotate independently of each other.